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AN INDUSTRY STANDARD FOR FLUID POWER

Pneumatic fluid power – Recommended practice for calibration and use of flowmeters

Descriptors: calibrating, flowmeters, flowmeter data, pneumatic fluid power, pneumatic products, rating information, test set-up

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NATIONAL FLUID POWER ASSOCIATION, INC.

3333 N. Mayfair Road / Milwaukee, WI 53222-3219 USA
PHONE: +1 414 778 3344 / FAX: +1 414 778 3361 / E-mail: nfpa@nfpa.com

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Foreword

This Foreword is not part of NFPA Recommended *Practice Pneumatic fluid power — Recommended Practice for calibration and use of flowmeters*, NFPA/T3.21.18-1994.

Project NFPA/T3.21.18 originated at the 11 November 1992 Pneumatic Valve & Conditioning Section meeting where it was agreed to develop a TSP for a calibration of a flowmeter standard.

The TSP was submitted to and approved by the Technical Board on 21 January 1993.

At the 24 March 1993 T3.21 meeting, Cliff Allen (Lexair, Inc.) agreed to serve as Project Chairman. Gary Baumgardner (Parker Hannifin Corp.) agreed to help him with the standard. Draft No. 1 was attached to the T3.21 minutes from that meeting to be reviewed before the next meeting.

Draft No. 2 was attached to the 18 August 1993 meeting minutes for committee review. Draft No. 3 was handed out at the 17 November 1993 T3.21 meeting. T3.21 recommended that the document be sent out for General Review.

Headquarters' Technical Staff prepared the document for General Review on 3 January 1994. The General Review closed with comments from three companies.

At the 9 February 1994 meeting, Cliff Allen stepped down as Project Chairman and Gary Baumgardner (Parker Hannifin Corp.) agreed to accept the position.

The revised document was reviewed at the 25 May 1994 meeting. It was agreed to send the document to the Technical Board for approval to Ballot contingent upon the commentators signing off. Project Chairman Baumgardner sent out letters to the commentators on 1 June 1994. The document was mail balloted to the Technical Board and approval to Ballot was granted.

Project Chairman Baumgardner updated the document again on 15 August 1994. The title of the document was revised and approved by the Technical Board at their 18 August 1994 meeting changing the document from a standard to a recommended practice.

The document was sent out for Ballot on 19 August 1994. No negative comments were received from Balloting. This document was granted final approval at the 8 December 1994 Technical Board meeting. At that time two of the ISO documents listed in the references were not yet approved standards.

Headquarters sent a letter to the two committees responsible for each document asking them to notify NFPA when the documents were approved. Headquarters received a letter from ISO explaining that documents at the DIS stage may be referenced in a completed standard because they are "publicly available" from ISO although they are not published yet. As a result of this letter, T3.21.18 was published.

Project Group Members who developed this standard:

Gary Baumgardner

Project Chairman
Parker Hannifin Corp.

Cliff Allen

Project Chairman (1992 - 1994)
Section Vice Chairman
Lexair, Inc.

Logan Mathis

Section Chairman
Ross Controls

David Prevallet

Technical Auditor
Dana Corp.

Linda E. Gasso

Technical Coordinator
National Fluid Power Association

Shirley C. Seal

Manager of Standards Development –
Industry/National
National Fluid Power Association

Richard Banfield

Ford Motor Co.

John Berninger

Parker Hannifin Corp.

Anthony Bratkovich

AMT

Michael Lyons

Rexroth/Pneumatics

Bruce McCord †

Aro Corp.

John Pousma

NORGREN

† Deceased

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Introduction

Accuracy of flowmeter data is important, in order that manufacturers can rate their products correctly for flow, and users can rely upon the rating information in order to properly select components for their applications.

One of the inconveniences typically encountered in calibrating flowmeters is shipping it to a remote facility for calibration and shipping it back. The time delay removes the flowmeter from use, and the shipping process subjects the flowmeter to potential damage. Consequently, there is a question of confidence in the flowmeter's accuracy upon its return.

This NFPA Recommended Practice describes a method of calibration performed on-site, using a fixed reference device traceable to an NIST standard. This results in the flowmeter being calibrated against a third level standard; the reference device itself is calibrated against a second level standard at a certified facility whose methods and equipment are, in turn, calibrated from the NIST primary level.

This third level calibration of a flowmeter has several advantages over a typical second level calibration:

- The potential for shipping damage can be avoided.
- By having a reference device available, calibrations can be performed much more frequently, potentially for every test set-up, rather than the periodic calibration performed when a flowmeter is shipped out.
- The reference standard described in this recommended practice is rugged, it is not subject to the same type of shipping damage as a flowmeter.

Consistency is a key requirement when determining the relative merits of pneumatic products available in the marketplace. The basis for consistency is uniform standards. Adopting the practice of calibrating flow meters to known reference devices is necessary to improve the consistency of information on pneumatic products. This practice is intended to facilitate an ongoing high level consistency.

Pneumatic fluid power — Applications standard for calibration practice and use of flowmeters

1 Scope

This NFPA Recommended Practice describes methods of calibrating pneumatic flowmeters used in laboratories and in production testing for pneumatic fluid power components. It describes how a reference device is prepared, calibrated and then used as the means to calibrate pneumatic flowmeters on-site. It further describes how flowmeters should be used in service and how they should be maintained.

This practice is intended for use with only two classes of reference devices: sonic (critical flow) and subsonic flow reference devices.

2 Normative references

The following standards and materials contain provisions which, through reference in this text, constitute provisions of this document. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. NFPA maintains registers of currently valid NFPA/ANSI standards.

ANSI/B93.2-1986, *Fluid power systems and products — Glossary*.

ANSI/IEEE 268-1992, *Metric Practice*.

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*.

ISO 5598:1985, *Fluid power systems and components — Vocabulary*.

Flow Measurement Engineers Handbook, Second Edition, R. W. Miller, McGraw-Hill Publishing Co., Copyright 1989

ISO 9695-1:—¹⁾, *Measurement of gas flow rate - Volumetric method - Part 1*.

ISO 11631:—¹⁾, *Methods of specifying flowmeter performance*.

Emerson Electrical Co.; Brooks Instrument Division; Technical Bulletin T-022, April 1986.

3 Definitions

For the purpose of this practice, the following definitions apply. For definitions of other terms used, see ANSI B93.2 and ISO 5598.

3.1 reference device: A fixed flow device (nozzle, venturi, orifice), calibrated by means traceable to NIST standards, and used for on-site calibrations of flowmeters.

¹⁾ To be published